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WHITE PAPER

Next Generation Universal Service toward Ubiquitous Broadband Ecosystems in ASEAN (USO 2.0)

JUNE 2018

This publication was produced by Nathan Associates Inc. for review by the United States Agency for International Development.

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WRITTEN FOR
USAID

UNDER CONTRACT
AID-486-C-13-00004
ASEAN Connectivity through Trade and Investment (US-ACTI)

SUBMITTED BY
Nathan Associates Inc.

ACRONYMS

AMS	ASEAN Member States
ASEAN	Association of Southeast Asian Nations
BTRDF	Thailand Broadcasting and Telecommunications Research and Development Fund for the Public Interest
CapEx	Capital expenditure
CIC	Community ICT center
ICT	Information and communications technology
MOU	Memorandum of understanding
PIIM	1Malaysia Internet Centre
PPP	Public-private partnership
RFP	Request for proposals
SPV	Special purpose vehicle
Tech4Ed	Technology Empowerment for Education Employment, Entrepreneurs, and Economic Development
US-ACTI	ASEAN Connectivity through Trade and Investment
USAID	United States Agency for International Development
USF	Universal Service Fund
USP	Universal service provision
USO	Universal service obligation
USO 2.0	Next generation universal service toward ubiquitous broadband ecosystems
USOF	Universal Service Obligation Fund
USPF	Universal Service Provision Fund
VTF	Vietnam Public-Utility Telecommunication Service Fund

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1.0 Introduction

This white paper addresses the goals of Universal Service Obligation (USO) policies on information and communication technology (ICT) development in countries of the ASEAN region. It presents background, discussion, ideas, and recommendations for establishing and updating USO policies for ASEAN Member States (AMS), to reflect changing conditions and objectives in the regional and global ICT markets. The ultimate goal is to support the adoption by AMS of next-generation USO policies that will help drive universal broadband ICT ecosystem development throughout the region.

The first draft of this white paper was the substantive foundation for a workshop conducted among AMS representatives in March 2018. This final revised white paper incorporates the information and viewpoints at the workshop in its findings and recommendations.

The paper includes the following sections:

- Section 2 provides background and context on the evolution of USO policies and practices worldwide as well as the scope of the broadband ICT ecosystem.

- Section 3 addresses updating and enhancing Universal Service Funds (USFs), including the key features of USFs, challenges and opportunities for enhancing USF performance, and some key complementary and alternative approaches.

- Section 4 describes objectives and options for ICT infrastructure and service programs, including backbone network infrastructure and mobile network access and service.

- Section 5 describes objectives and options for community and institutional broadband access programs, including local fixed broadband access networks, community information centers, and institutional connectivity.

- Section 6 describes objectives and options for ICT demand support and stimulation programs, including projects on ICT content and applications, digital literacy, and ICT affordability.

- Section 7 focuses on the country reports presented at the March 2018 workshop on USO policies for ASEAN, providing examples of innovative programs currently being implemented across the region

- Section 8 sets out an initial analytic framework for developing a forward looking USO strategy for consideration by ASEAN Member States while highlighting some of the key current trends in ICT development that a next generation USO policy should address.

- Section 9 provides conclusions and recommendations for consideration by ASEAN.

2.0 Background

2.1 Evolution of USO Policies and Practices

The goal of universal access to telecommunications services has been a key element of national development policies for decades. Even in the earliest eras of telegraph and telephone networks, governments sought to enable access to services such as public utilities, through state-owned enterprises or regulatory measures.[1]

The benefits of universal communications are widely understood. In pure economic terms, the "network externalities" that arise from expanding the base of users connected to such services ensure that increasing access results in greater overall value to all customers, suppliers, and society as a whole. From a social perspective, empowering citizens and communities to connect with each other, locally, nationally, and globally, magnifies the benefits of knowledge sharing and cultural integration immeasurably.

As the global telecommunications industry grew, these objectives were typically addressed through internal industry cross-subsidies, mandated by governments and regulators. Telecom operators subsidized investments in high cost or low revenue market segments with profits from high value segments and wealthier customers. This model came to be known as the Universal Service Obligation (USO) policy, with the "obligation" resting with the monopoly or dominant national telecom providers. It was moderately successful in expanding basic telephone services, but seldom approached achieving true "universal" service, especially in less developed economies. However, as technological advances reduced costs and broke down economic barriers to competition in telecommunications, the model of state control and internal cross-subsidy became unsustainable.

The era of widespread and growing telecommunications competition, beginning in the late 1980s, brought rapid innovation and meteoric cost declines to the industry, which combined to fuel exponential growth in customer demand. These trends helped greatly to expand universal access to communication services, but also highlighted the lingering gaps that remained, in both developed and especially less developed markets. A new set of policies for promoting universal service in telecommunications was introduced in the 1990s and 2000s, focusing on Universal Service Funds, were set up to adapt the ongoing universality goals to these new market conditions. (See section 3, below.)

[1] For background, see ICT Regulation Toolkit at http://www.ictregulationtoolkit.org/toolkit/4.

As technology and market conditions have continued to evolve, universal service goals and policies face challenges in trying to keep pace with the needs of society and the economic and social trends driving the expanding ICT sector worldwide. Past goals of providing access primarily to voice telephony—via public pay telephones in many towns and villages—soon gave way to the cellular mobile telephone revolution, with new objectives to make mobile signals universally available. As the internet and data communication have come to dominate the global ICT market, universal service policies have also begun to adapt to demand for these new, highly valuable services and applications.

Most recently, the growing prominence of high-speed broadband networks and services has compelled policymakers to upgrade their universal service objectives yet again, now with focus on universal broadband ICTs throughout society.[2]

This vision requires understanding of the wide scope of factors that make up the broadband ICT "ecosystem," which all must be considered in defining policies to encourage effective, meaningful universal access to advanced broadband ICTs. The next section highlights these concepts.

2.2 The Broadband ICT Ecosystem

Effective access to broadband internet and mobile services and applications involves an extensive set of interdependent elements, comparable to ecosystems in the natural world. Constructing networks and physical facilities is not enough. Whereas adoption of basic mobile (voice and text) telephone has involved a relatively straightforward range of infrastructure investments and customer take-up, for broadband to achieve critical mass adoption all of the components of the ecosystem have to develop synergistically.

This is what has happened over the past decade-plus in the most economically advanced markets, where the market foundations for the ecosystem's evolution were already in place. But these prerequisites are largely absent in most under-developed economies, and especially among rural, low income, and other disadvantaged populations.

The main elements of the broadband ICT ecosystem are illustrated in the following diagram, which shows the key linkages and underlying influences that drive broadband growth and adoption:

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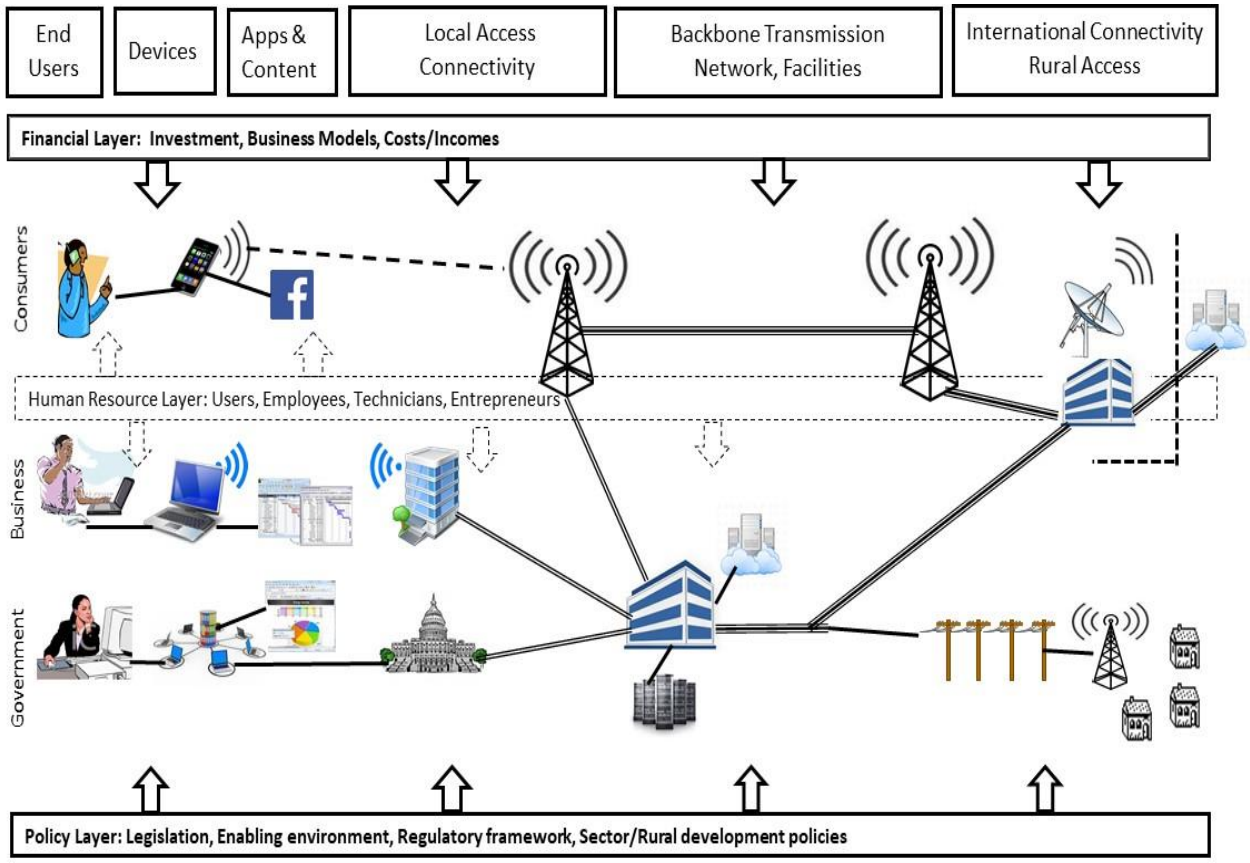
[2] Townsend, David. 2015. *Universal Access and Service Funds in the Broadband Era*. Washington, DC: A4AI. Available at http://a4ai.org/wp-content/uploads/2015/03/A4AI-USAFs-2015_Final-v.2.pdf.

Figure 1. Key Components that Drive Broadband Growth and Adoption



Source: David N. Townsend & Associates

These key components include:

- End users: Humans (and even some "things") who connect to networks, use devices and applications, and share knowledge and information of every kind, across the world.

- ICT devices: Computers, smart phones, tablets, servers, local area networks, and a host of other devices that allow end users to connect to and access the ICT world.

- Applications and content: Software platforms, programs, mobile apps, websites, and other infinite information sources that represent the substantive value of ICTs.

- Local access connectivity: Wired and wireless telecom access networks that connect end user devices to voice and data services.

- Backbone transmission networks and facilities: National high-capacity transmission networks, typically fiber optic, linking major cities and carrying national voice and data traffic among core switching and interconnection facilities.

- International connectivity: Links to international fiber cables, satellite networks, and internet exchange points that connect all global networks to each other.

- Rural access: Network extensions into rural areas beyond the reach of main backbone and access network coverage, achieved by a range of wired and wireless technologies.

- Financial layer: The financial components of all ecosystem elements including required capital investments and operating expenses, and the customer revenues that ultimately pay for them.

- Policy layer: The legislation, national policies, regulatory framework, and all other public policy mandates that govern all of the various features of the ecosystem.

- Human resource layer: The technicians, management, workers, and all other personnel involved in creating, delivering, maintaining, and innovating at each level of ICT ecosystem development and operations.

USO policies for broadband ICT development need to take into account all of these elements, address gaps in access, affordability, and user capabilities, and bring together suppliers, customers, and local and national officials to define comprehensive broadband development strategies.

3.0 Funding Universal Service

Achieving universal service in broadband ICTs depends upon many factors—technological, political, and especially economic. Broadband telecommunications networks, services, devices, and applications, including all of the components described above, are costly to produce and maintain. While the global ICT industry has demonstrated that such products can be very profitable in the marketplace, there are nevertheless many population and geographic segments where market forces alone cannot deliver broadband ICT services that are available and affordable to all.

A central focus of universal service policies, therefore, is how to ensure adequate funding will be made available to bring broadband ICTs to all geographic locations and populations. This section addresses the funding side of USO policies, including the role of the market and approaches to evaluating and addressing access gaps, with emphasis on Universal Service Funds, along with discussion of some alternative mechanisms.

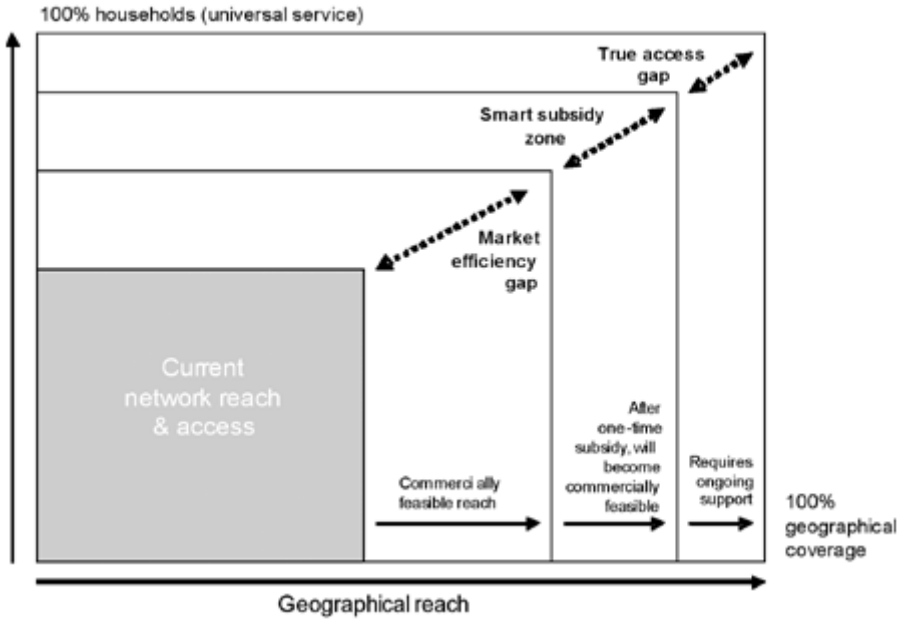
3.1 Market Efficiency and Access Gaps

By far the most extensive source of funding and investment in ICT resources is the private sector: the companies, operators, suppliers, and service providers that build and deliver these technologies around the world. Throughout the ICT revolution, market forces have been the primary drivers of increasing access, as well as technology upgrades and all types of innovations that have expanded the reach and value of these services. Private commercial market-based incentives will continue to be the source of most ICT investments in all countries and at all levels of economic development; public policies must continue to enable and encourage such market-driven growth.

The goal of universal service policies is thus not to supersede or constrain these market forces, but to complement them and reinforce them, only where necessary. One of the main challenges for such policies is to understand the distinction between market segments that can (and will) be served efficiently by the commercial sector, and those segments that require some form of public intervention. Market and access gap analysis is a key framework for examining these distinctions.

The diagram below illustrates this theoretical framework[3]:

Figure 2. Market and Access Gap Analysis Framework



Source: ITU-infoDev ICT Regulation Toolkit, Chapter 4.1.3.3 Market Gaps and Universal Access Policy.

The diagram represents a market or market segment, for example mobile broadband service in a given country. It shows areas where there is currently service access, and those where access is not yet available. Within the unserved areas, some locations are considered within the "Market Efficiency Gap," meaning that these are places where market forces should be able to expand profitably, without subsidy. The "Smart Subsidy Zone" (sometimes also known as the "Sustainability Frontier" shows where viable markets could be established with a one-time capital subsidy. The "True Access Gap" represents the least economically viable areas, where ongoing subsidies would be needed to provide service.

This framework provides a basis for designing USO policies to address the Access Gaps in broadband network and service coverage, while ensuring that market forces have the opportunity to expand as far as possible on their own.

3.2 Updating and Enhancing Universal Service Funds

This section discusses the role of Universal Service Funds (USFs) as a primary policy and funding mechanism for promoting universal service objectives. The discussions below highlight the range of issues and details involved in enhancing the

[3] ITU-infoDev. *ICT Regulation Toolkit*. Chapter 4.1. Available at http://www.ictregulationtoolkit.org/toolkit/4.1.

role of USFs in ASEAN, and present options for updating and enhancing the role of USFs.

Overview of USFs

USFs have operated in dozens of countries, including nations in the ASEAN region, for many years.[4] Traditionally, these funds have served as a key mechanism for channeling funding from telecommunications industry sources and revenues (which have been earned from the most profitable market segments) toward subsidizing the build out of infrastructure and services in marginal, rural, and remote locations.

The USF model has different characteristics in different countries, and a range of approaches have been introduced over the years. However, certain basic features are typically found in most USFs in the developing world, including in ASEAN countries. These generally include the following:

- Collect mandatory contributions from licensed telecom operators into a common Fund, typically in the range of 2 percent to 5 percent of gross operator revenues.
- Identify gaps in access to ICTs and other priority needs that are not being served by the commercial market.
- Allocate USF resources toward subsidizing projects that will close the identified gaps.
- Conduct competitive bidding processes among qualified firms to receive the subsidies and undertake the defined projects.
- Monitor and evaluate the effectiveness and impact of USF projects, and overall progress toward achieving fund objectives.

The institutional structure and operational models of USFs also differ across countries. In some cases, the funds are managed by a unit within the national telecom regulatory agency, or even a government ministry. In others, a separate organization is established, with semi-autonomous authority to collect and manage the USF. The mandate, rules of procedure, and functional roles and tasks of these operations vary considerably, and these structures can have a significant impact on the fund's success.[5]

[4] See the recent study on USFs in the Asia-Pacific region by United Nations ESCAP: ESCAP. 2017. *The Impact of Universal Service Funds on Fixed-Broadband Deployment and Internet Adoption in Asia and the Pacific.* Available at http://www.unescap.org/sites/default/files/Universal%20Access%20and%20Service%20Funds%20final.pdf.

[5] ITU-infoDev. *ICT Regulation Toolkit*. Chapter 4.5. Available at http://www.ictregulationtoolkit.org/toolkit/4.5.

The focus of activity for most of the earliest models of USFs involved construction of public fixed (voice) telephone facilities in unserved villages—often linked via satellite connections and providing just a single basic communication lifeline to each local community.

As the telecom industry has continued to evolve, USF models and experiences have changed as well in many countries. Most fund policies have shifted away from basic public telephone service toward more expansive objectives related to the wider broadband ecosystem.[6] Many USFs have turned from fixed service to promoting increased mobile phone coverage, often including mobile data services. Others have invested directly, expanding broadband network infrastructure including fiber backbone networks. Many support public access to fixed internet services, via community internet centers or other facilities. In some cases, USFs also help connect schools and health clinics via broadband internet. Most recently, some USFs have been also looking into promoting ICT demand stimulation through various new types of programs. Sections 4, 5, and 6 of this white paper address the range of potential USF and related USO policies and programs.

Criticisms of USF performance

Many USFs have around the world have demonstrated the viability of the approach described above in coordinating and channeling resources toward expanding access to telecommunications networks and services, including broadband ICTs. However, there have also been cases in which USFs have performed below expectations, whether by failing to establish and organize the fund, collecting money but not spending it effectively, or by investing in unsuccessful or inefficient projects. Addressing these challenges should be a central objective for ASEAN officials, to ensure they take advantage of the opportunities that USFs can provide.

Criticisms of USFs has come primarily from the telecom industry operators that are mostly responsible for contributing to the funds from their revenues. These operators would often prefer not to have to pay into such funds, or at least to be confident that the money is well spent on projects that will benefit them. Other criticisms have come from governments, local communities, and other stakeholders when a USF does not deliver the ICT infrastructure and services it has been created to provide.

Some of the specific types of shortcomings identified by USF critics, such as the GSMA[7], which represents mobile operators, have included the following:

[6] Intel. 2011. *The Benefits of Applying Universal Service Funds to Support ICT/Broadband Programs* at https://www.intel.com/content/dam/www/public/us/en/documents/white-papers/usf-support-ict-broadband-programs-paper.pdf.
[7]Penteriani, Gala. “Are Universal Service Funds and Effective Way to Achieve Universal Access?” GMSA blogpost. April 18, 2016. Available at

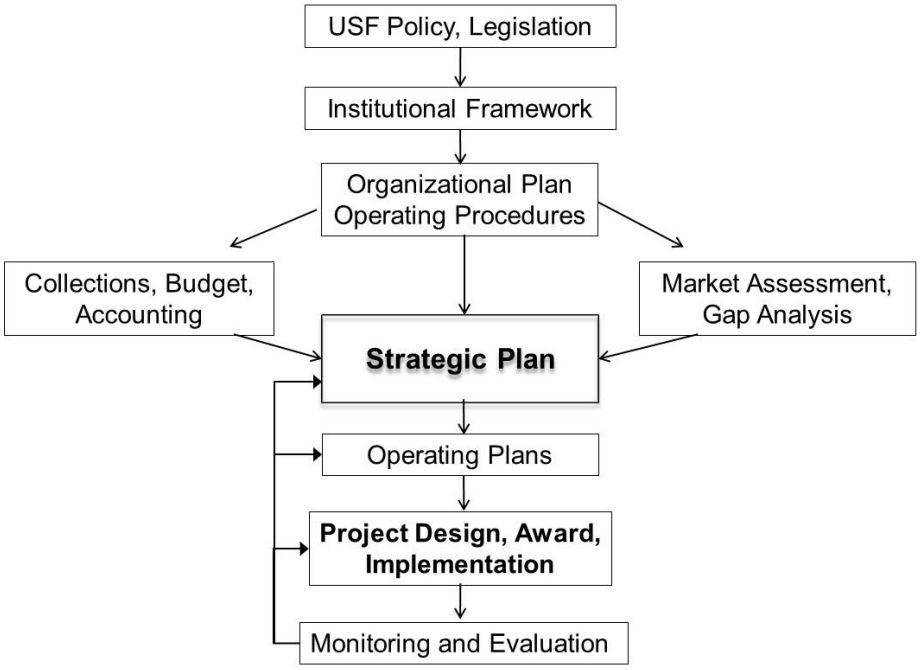
- USF framework and rules that do not support or permit use of the funds for the services required (e.g., wireless, broadband)
- Inadequate or misguided articulation of fund strategy and objectives that impede effective administration
- Local conditions that impede or endanger the full deployment of approved projects
- The absence of adequate primary infrastructure and facilities, thus impeding or precluding project deployment (e.g., accessible transmission backbone)
- Inefficient or excessively complex decision making, approval and governance processes
- Inadequate skill levels available for rural rollout, ongoing maintenance, and sustainability
- Structural flaws in setting up the fund and its relationship with the various other institutional bodies involved in oversight or policy making
- Lack of qualified and/or interested vendors to bid on USF projects
- General managerial, operational, and capacity issues.

Enhancing USF institutional planning and operations

Establishing and operating an effective USF requires a number of key steps and decisions, and the development of an institutional framework and practices that ensure appropriate use of the funds collected. The following diagram highlights the main areas of focus that any USF should address to optimize performance. There are a variety of approaches and details to be determined under each item.

https://www.gsma.com/mobilefordevelopment/programme/connected-society/universal-service-funds-effective-way-achieve-universal-access/.

Figure 3. Main Areas of Focus to be addressed by USF



Source: David N. Townsend & Associates

For a USF to be most productive in meeting Universal Service goals, and overcoming some of the criticisms listed above, it must effectively define and implement each of these components. Briefly, the main elements to address include:

- USF policy, legislation: The government must adopt the basic enabling statutes and policies that define the fund's authority and mandate.

- Institutional framework: The fund must have a clear institutional structure, whether as a department within the regulator, as a separate agency, or using an alternative framework. The role and authority of the USF body must be clearly defined, including the membership of its board of directors.

- Organizational plan, operating procedures: The USF governing board and management should define all key internal structures and rules relating to the fund's operations. Clear roles and functions for fund's administration must be established, and specific responsibilities should be agreed for how the fund will operate.

- Collections, budget, accounting: Processes for collecting mandatory contributions (and other income) must be established, with transparent and independent accounting procedures and budgets. Regular audits must be conducted and made available to the public.

- Market assessment, gap analysis: The fund's administration should conduct periodic reviews of ICT market status, including an access gap analysis to identify changing market conditions and areas of greatest need, as well as to support budgeting and strategic planning.

- Strategic plan: The fund's management and board should develop a long-term (4–5 year) strategy for how the USF will be used, its objectives and targets, and priority programs and projects. This strategy should be developed with stakeholder input.

- Operating plans: Fund management must develop annual operating plans based on the strategy, to lay out the scope of projects, budgets, and targets for each fiscal year. Such plans should describe the anticipated projects to be undertaken, with timing and milestones, to allow interested contractors to plan accordingly.

- Project design, award, and implementation: There must be clear and consistent procedures for designing projects to be financed by the fund. They should also be consistent with the overall objectives and strategy. Project design should take account of stakeholder input, from both suppliers and end users. Processes for awarding contracts on a transparent and competitively neutral basis should be defined. Project implementation requirements should be clear and linked to defined milestones and outcomes.

- Monitoring and evaluation: The fund must have a comprehensive and well-designed monitoring and evaluation policy, to support ongoing review of USF projects, the compliance of implementing contractors, and the impacts and effectiveness of all USF programs over time.

Key USF issues

ASEAN Member States that have active USF operations or are considering establishing or modifying such funds, should address several key issues. The following are some of the most significant:

- *How should the fund be organized, structured, and managed?*

  The institutional and organizational framework of the USF will play a critical role in determining the success of the fund. There must be sufficient authority and autonomy to manage the fund and make key decisions without undue political interference. The organization must have sufficient personnel and internal resources to perform its functions efficiently. These requirements are needed regardless of whether the fund is a stand-alone agency or a department within the regulator or another body.

- *What levels of contributions should be required, and by which industry players?*

  Decisions on contributions must be clearly determined in law and policy, and must be made on an equitable basis. Traditionally, USFs have mainly collected a small percentage of major licensed telecom operator revenues. Recent debates have suggested expanding the sources of contributions, for example to include unlicensed over-the-top (OTT) providers (such as Viber and WhatsApp), which benefit from universal (data) service. Other contributors sometimes include internet service providers, broadcasters, and other types of technology companies. The levels of funding and market fairness derived from such wider sources must be weighed against the political and practical challenges of expanding the fund's pool of contributions.

- *What should be the priority objectives of the USF, and what types of projects should be financed?*

  Traditional USFs have primarily focused on subsidizing telecommunications network infrastructure build-out in rural areas, including both fixed and mobile telephone networks. In the context of the broadband ICT ecosystem, USF objectives and project scopes may be expanded to include demand-side projects as well, such as digital literacy programs, development of applications and content, and contributions to e-learning and e-health initiatives, among others. Fund resources are, by definition, limited, however, and other sources and partners should be involved in planning and supporting many of these newer activities.

- *What entities should be eligible to receive funding?*

  As the scope of USF objectives and projects widens, the funds may also look to expand the range of firms and organizations that can receive USF funding, especially for non-telecom infrastructure projects. The decision to award funds to entities that do not contribute to the Fund can be controversial, and the USF must seek to ensure transparency and fairness, while continuing to allocate the bulk of resources toward contributing firms.

- *How can the USF administration best ensure transparent, equitable, and effective use of its resources?*

  It is vital that USFs establish a reputation for credibility, transparency, and fairness, as well as demonstrating the value of the fund's activities. They must adopt clear and consistent procedures, follow public consultations on major decisions, issue reports on all activities, maintain public web sites with access to all pertinent fund information, and conduct regular and transparent monitoring and evaluation of fund projects.

3.3 Complementary and Alternative Funding Approaches

USF policies can be augmented or substituted by other mechanisms to help finance ICT development goals. In most countries, some combination of the practices below have been followed to varying degrees. As USFs are expanded and enhanced, ASEAN Member States should also revisit these approaches, to help construct the most effective policy framework for expanding access to the broadband ICT ecosystem.

Rollout obligations and pay-or-play

These two options for funding telecommunications network infrastructure and related investments are related, although they involve somewhat different roles and responsibilities. The basic concepts are as follows:

- Rollout obligations: As a condition of being granted a license, telecom operators are often required to build and operate networks in designated areas that might otherwise be commercially unattractive (i.e., within the economic access gap). These obligations may be defined at the time a license is granted, or at renewal. The net cost of such mandatory (unprofitable) network rollouts is borne by the operator directly, as a form of in-kind license fee. The Philippines, among other ASEAN countries, introduced a system of such mandatory network deployment as part of its competitive market policies.

- Pay-or-play: Some USF policies allow for operators to choose between paying their mandatory contribution to the fund, or "playing" by directly building and operating networks and services in designated universal service areas. The net cost of these "play" projects should be equivalent to the amount of contribution that the operator would otherwise be required to pay into the fund.

  Cambodia's new USO policy allows for this option, at least during the first year of the program and Fund's operations. Operators may select designated universal service areas to deploy networks directly, and may apply for an offset of their USF contribution requirement based on the cost, up to 50 percent of that obligation.

Both approaches are based on the principle of allowing operators to invest directly in network development, without involving USF project design and procurement processes. There are several key challenges involved in effectively implementing such policies, such as:

- The locations to be covered by “play” or rollout projects need to be defined clearly, and must be within the economic access gap, not areas that the operator would build of its own accord.

- The net cost of the investment incurred by the operator must be reasonably measured in relation to the level of required contribution or the value of the license.

- Operator compliance with these obligations must be monitored and enforced, to avoid incomplete build out or undue changes to agreed project requirements.

These and similar challenges require analysis and oversight of operator network projects comparable to what is needed to manage conventional USF operations. If such capacity and procedures can be well established, then rollout obligations and pay-or-play methods can, in principle, be adopted as one potentially efficient component of universal service policy.

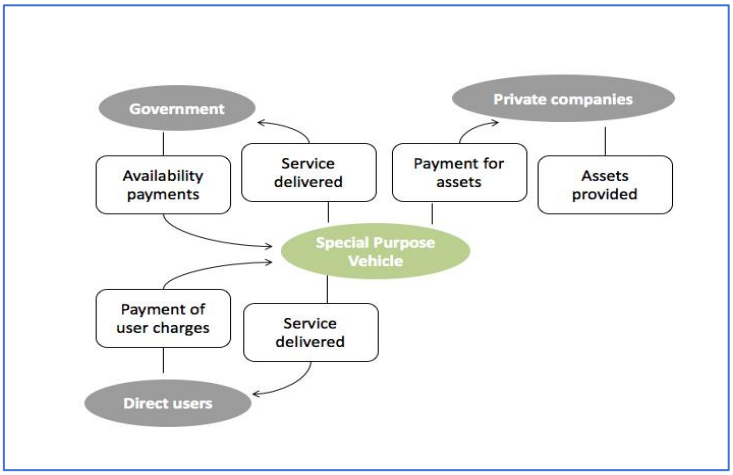
Public-private partnerships

In a typical public-private partnership (PPP), the government engages a special purpose vehicle (SPV) to design, build, maintain, and operate a facility that is required to deliver specified services, paid for through user charges from direct users (and/or availability payments from the government), conditional on meeting specific key performance indicators (KPIs).

PPPs cover agreements between a government and one or more private partners, for the private partner(s) to deliver an agreed quantity and quality of service, in return for a charge paid by the government and/or by the direct recipients of the service.

The private partners are usually responsible for both the construction and operation phases. Some degree of risk sharing between the public and private partners is determined on the basis of which party is best able to manage each risk.

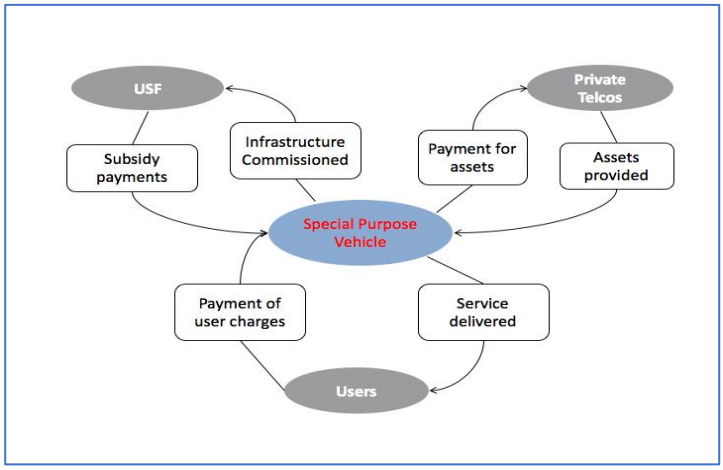
Figure 4. Public-Private Partnership



Source: Authors' formulation

PPP for universal service: The PPP concept can also be applied to provide universal ICT services. In this case, the SPV must be provided with some kind of an operational license. The government's role can be performed by the USF organization, or it can be handled under some related program.

Figure 5. PPP for Universal Service[8]

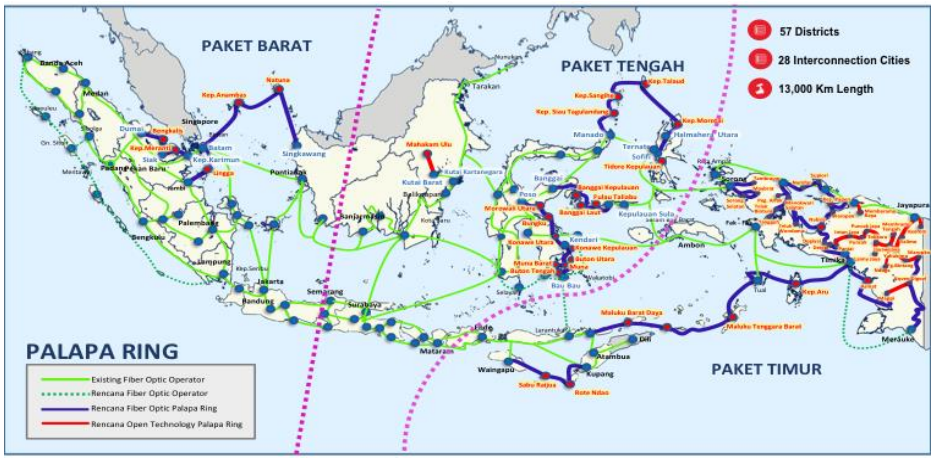


Source: Author's adaption

Indonesia's Palapa Ring project (including its "uneconomical" eastern part) funded by USO, is a good example of a PPP model.

[8] Note that Telecos = telecommunications companies.

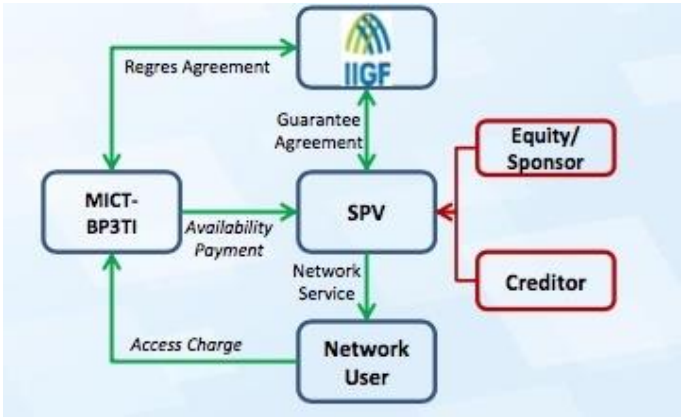
Figure 6. Palapa Ring PPP



Source: Presentation provided by the delegate from Indonesia at the Workshop on USO 2.0 in Nay Pyi Taw, Myanmar, on 6 March 2018

In Palapa Ring project, the private SPV is responsible for the financing, construction, operation, and maintenance necessary to make the fiber optic cables available for network users. The public service agency, BP3TI, under the Ministry of Communication and Information Technology Indonesia is responsible for making periodic subsidy payments to the SPV.

Figure 7. Financing Mechanism Palapa Ring PPP



Source: Presentation by Pradana Murti, Head of Project Development Division of the Infrastructure Company PT SMI (slide 17 and 18), made at the APN Conference in Seoul, on 30th November 2017

Since the Palapa Ring PPP is an ICT project which operates in a challenging area with a limited number of potential users, it is also covered by a guarantee agreement with the Indonesia Infrastructure Guarantee Fund (IIGF).[9] In a deviation from the

[9] The IIGF provides government guarantees for infrastructure PPP projects.

generic PPP model, all the revenue collected as user charges goes to BP3TI. In case there is not enough demand, the risk is that of BP3TI.

Another example is India’s National Optic Fiber Network (now called BharatNet). It is also a kind of PPP, for which Bharat Broadband Network Limited (BBNL) was incorporated under the Companies Law to act as an SPV, and the funding is provided by Universal Service Obligation Fund (USOF).

4.0 ICT Infrastructure and Service Programs

The most widespread types of USO programs and projects have been, and continue to be, those that support the build-out of telecommunications and ICT infrastructure and networks, and those that provide retail telecom services for unserved and underserved areas and populations. While the scope of such infrastructure and service projects has evolved, the overwhelming bulk of USF budgets and related initiatives should continue to be allocated to these supply-side programs, wherever needed, until true universal coverage of such networks is achieved. In this context, the two main types of programs tend to involve (1) backbone network infrastructure, and (2) mobile telephone networks and services. The key objectives and options that projects in each category should address are described below.

4.1 Backbone Network Infrastructure

In most countries, telecommunications operators have difficulty connecting rural regions to national networks, due to cost, terrain, population density, and other concerns. While satellite and microwave transmissions can provide coverage in some cases, they are often not cost-effective. In the context of universal broadband ICT development, it is vital to link all regions via high capacity, high-speed backbone network connections, to support robust local and national access and data transmission requirements.

This typically calls for the installation of fiber optic backbone networks, including international and domestic/intercity links, and extensions of fiber access connections into regional and rural centers. USO projects can be established where the costs and logistics of creating such fiber backbone infrastructure are unappealing to commercial operators and investors. The Indonesia Palapa Ring project, referenced above, is a prominent example of this type of infrastructure initiative.

Objectives:

The main objectives of backbone network infrastructure USO projects include:

- Extending backbone network links to rural, unserved regions, providing regional points-of-presence to support local broadband network access.
- Creating backhaul capacity to enable retail telecom operators to provide local services cost-effectively.

- Integrating the country geographically and economically, especially the most remote and outlying areas.
- Improving quality and decreasing costs for national telecom transmission services.

Project options:

USO projects to support backbone network development can take several forms, and they can be implemented individually or as part of larger infrastructure and service programs. Some of the most prominent options include the following:

- Competitive subsidies for private wholesale operators to install new backbone network; the network can be established regionally, in segments, or nationally.
- Public-private partnership arrangements, with government co-financing and co-ownership of infrastructure assets, and participation by one or multiple operators in structured joint venture.
- Coordination of the backbone infrastructure with the rollout of the mobile network; in this arrangement, mobile operators develop backbone infrastructure in collaboration with wholesale operators.
- Coordination of backbone infrastructure with related rural infrastructure projects, (e.g., roads and power); alignment of public and private investments across sectors (e.g., the “dig once” policy).

4.2 Mobile Network Access and Service

As mobile voice and data services have come to dominate the world ICT market, most countries have shifted their USO policies to emphasize universal access to mobile telephony. With the increasing focus on broadband services, this emphasis has recently begun to encompass not only traditional basic mobile service (voice and text), but also high speed mobile data services: at least 3G network quality or higher.

USO projects that address such goals have most often involved subsidizing the construction of cell towers and the installation or upgrading of base stations in unserved and underserved areas, usually by one of the existing licensed mobile network operators (MNOs). Some innovative projects have created incentives for smaller rural operators to pursue newer technologies and business models that may be better suited to rural environments and customers. The programs implemented under the Digital Thailand objectives of the Thailand USF, for example, include an emphasis on affordable and scalable rural technologies (see section 7 below). The key purpose of such projects must be to bring the benefits and opportunities of broadband mobile communications to populations who have not yet had this type of access.

Objectives:

The general objectives of broadband mobile network and service USO projects are, as stated above, to provide mobile service coverage in previously unserved and underserved areas. Some of the specific objectives that should typically be part of such projects include:

- Install new mobile towers, base stations, and other network infrastructure in locations where mobile signals are unavailable.
- Upgrade and enhance mobile network equipment and services to provide 3G+ broadband data services to all covered populations.
- Establish sufficient transmission and backhaul capacity to support broadband mobile data services in all communities receiving service.
- Coordinate among local communities, officials, operators, and stakeholders to build sustainable local infrastructure and markets.
- Ensure the availability of all relevant mobile data service features and functions at affordable prices.

Project Options:

Projects that focus on providing mobile network coverage and service may be implemented via a number of approaches, with multiple options for how operators may deliver service, their obligations and business models. Some of the key components that should be incorporated in such projects include as follows:

- The USF may design requests for proposals (RFPs) for qualified licensed mobile operators to bid for contracts to develop networks and provide services in identified unserved areas. Some projects may also be designed to support upgrade of existing 2G sites, typically within the same region as new network projects.

- Service locations should be only those where it is determined that mobile service would not be commercially viable without subsidy.

- All terms and conditions should be included in project RFPs, which should define locations and service obligations, including competitive open access to all infrastructure built with USF subsidies.

- Successful bidders can be determined by selecting the operator requesting the lowest subsidy to provide the required service. Alternatively, the contract may be awarded to the operator offering to deliver the greatest service coverage for a fixed subsidy amount.

- Funding budgets may cover Capital Expenditure (CapEx) only, or a combination of CapEx and Operational Expenses (OpEx) for projects that may not be sustainable in the short-term. The long-term goal for such projects, however, should be commercial sustainability wherever possible.

- Projects may also require the installation of necessary electrical power infrastructure or facilities, such as solar panels, to support the services. Other infrastructure may also be included, such as roads. These inputs should also be made available for general public use where possible.

- Projects may permit or encourage the use of innovative, low-cost technology options, to ensure more cost-effective delivery and encourage experimentation by qualified operators. In general, however, project bidding requirements should be output-based and technology-neutral.

5.0 Community and Institutional Broadband Access Programs

Although broadband mobile data services can provide extensive benefits to individuals and even some organizations and businesses, many potential users have more robust demand for broadband ICTs. The most effective solution for collective, larger-scale demand settings—such as schools, government offices, and public institutions, as well as public access facilities—is to deliver fixed broadband network access through wired or wireless technologies.

Therefore, one significant set of USO program options involves support for bringing high capacity broadband network connections into certain communities, and delivering such fixed broadband access to key locations. This type of program can also be combined with offering both public mobile data services and community access points once the capacity is in place. These programs can also be linked with demand-side initiatives such as content development and capacity building, as addressed in section 6 below.

The following subsections describe the objectives and options for three key types of programs in this area: Local Fixed Broadband Access Networks, Community Information Centers, and Institutional Connectivity. These can be developed individually, or often in combination to take advantage of synergies and economies in local broadband network and service delivery.

5.1 Local Fixed Broadband Access Networks

Projects of this nature involve extending high-capacity network links into unserved areas, to allow for community-wide broadband access. Local contracting operators receive subsidy support to establish publicly available retail fixed broadband communication services within each community, for purchase and use by local citizens, enterprises, and other customers. This type of project should generally only be implemented in parallel with public community access and/or institutional connectivity projects (see below), to take advantage of the shared infrastructure. Several ASEAN countries (e.g., Malaysia, Thailand, Indonesia, and Viet Nam) have included broadband access connectivity within their Universal Service programs, as identified in section 7 below.

Objectives

There are several related elements to projects in this category, whose combined objective is to make available high quality fixed broadband networks and services in key unserved communities, typically starting with more populous regional district centers. These elements are:

- Extension of the national fiber optic backbone network deeper into remote, unserved regions: Construction of fiber optic backbone infrastructure links along designated routes from existing nodes along new routes, into regional centers not currently on the backbone. These extensions create new backbone nodes that are directly connected to the national fiber backbone.

- Establishment of local broadband access network connections: Construction of last-mile broadband points-of-presence within each designated local community within a region, connecting to the new backbone nodes. These may be fiber optic, but they may also employ other broadband access technologies, such as TV White Space, as long as they deliver adequate capacity to meet all anticipated usage and speed requirements within the community. In some areas, satellite transmission may be used; this would replace both the backbone extension and local access, where cost-effective.

- Provision of public broadband communication services: Operation and provision of end-user public broadband service to subscribers in the target communities, including all voice, internet, and related service options (potentially including television as well). Such services should be available throughout the community, to allow connection of households, businesses, and other locations, at affordable prices.

Project Options

Such local broadband network projects can be implemented according to a range of business models, depending on the size and scope of each project, the involvement of local communities, and the interests of various stakeholders from operators to end users. The USF or government partners should provide sufficient funding to ensure the viability of the network and services. Various components may be delivered separately or in combination. Key options include:

- Projects can be provided by a single contractor in each area, with responsibility to build all infrastructure, install local equipment and facilities, connect customers, and provide service. Terms and conditions would be determined by the contract and overseen by the USF.

- Alternatively, there can be two or more separate contracts, for building infrastructure and for providing end-user services. A prime contractor could also be engaged, with identified service providers as subcontractors.

- In some cases, a project may involve a joint arrangement between the local community and the contracting operator, whereby the operator builds and maintains the network, providing wholesale access service, while a local entity is given responsibility for managing and selling public services. Such conditions can be adopted where there is sufficient capacity and willingness at the local level.

- While the main backbone extensions should be fiber optic, the local access links can be technology neutral and open to experimentation with alternative technologies. Project terms of reference should permit and encourage different technical solutions as long as they provide the necessary connectivity and capacity.

- Local broadband network projects should mandate open access to these networks for competing operators and service providers, under nondiscriminatory terms, conditions, and pricing.

- The local access network must also incorporate an electricity power source of sufficient energy to support continuous operation, as well as adequate backup energy supply.

- Prices for services should be largely based on commercial market conditions, but there should be certain low-cost “basic” service options that will make it affordable for any user to obtain entry-level broadband connectivity.

5.2 Community ICT Centers (CICs)

This type of program involves establishment of public access community ICT centers (CICs) within local areas, to provide community-wide access to full-service ICTs at publicly available locations. The CICs are to be connected to the local broadband network, making internet access, computers, ICT services, and training available to all local citizens. In ASEAN, Malaysia’s Community Broadband Centers (CBCs), and the Tech4Ed Centers in the Philippines are among the most successful examples of such facilities (see section 7.)

Objectives

A CIC is a public location that provides a combination of facilities and services, to enable public access to a broad range of ICT resources. The overall objective of CIC programs is to create sustainable local services that contribute to local economic and

social opportunities and expand the role and impact of ICTs in people's lives. The nature and structure of CIC operations can vary significantly, but they should ideally provide a core set of technical and support resources, such as:

- Broadband connectivity at a conveniently located public building or facility, which may be affiliated with a library, post office, public center, or school campus, or may be a stand-alone location.

- A rich selection of equipment, including good quality computers, possibly available tablets and smart phones, printers, fax and photocopy machines, servers and routers, etc.

- Appropriate software platforms and packages, tailored to local needs, such as language, literacy, and special needs, along with customized web portals and applications to facilitate access to the most relevant and valuable on-line content. CICs may also provide web and mail hosting services for their users.

- Trained management and staff, available to provide technical assistance, and to offer training classes in basic computer skills, as well as ICT entrepreneurship and business applications for small and medium enterprises.

- In addition, CICs can provide public internet access through external Wi-Fi signals from transmitters based in the CIC and/or linked to other locations, allowing users with Wi-Fi-enabled devices to access broadband signals in public places.

Project Options

CICs and similar types of public ICT access facilities have been established in numerous countries using a wide range of designs and operational models. Many different approaches have proven successful, although some have failed to achieve sustainable and effective results. It is not necessary to define a single set of standards for ASEAN countries, or even within one country, as different CIC models can be applied to different purposes or locations. The options below highlight some of the best practices, which should be considered in development or enhancement of CIC programs:

- CIC construction, equipment, and installation involves the physical creation of the CIC, including procurement and installation of necessary equipment, configuration and other technical setup, connection to the local broadband access network, and any other start-up requirements. This stage may be undertaken by a technical supply firm under a master CIC contract.

- Each CIC should have a minimum required configuration of available technology, including computers, broadband network connections, servers and routers, software platforms and applications, and related equipment and capabilities, specified in detail for each mandatory service location within each project's terms of reference. The size and scope of CIC installations may vary by location, according to population, demographics, geography, or other factors. In each case, however, the facility must be adequate to allow robust access to broadband ICTs for the local community.

- The location and housing for the CIC must be decided by USF management and local officials, so as to ensure that a publicly accessible and secure facility is created with clear ownership and stability. Project financing may cover the costs of building and/or renovating the appropriate space, as needed.

- The network connection (standalone vs. part of infrastructure project) is also important: The broadband connections to the CIC may be linked to network access points within each community, potentially developed under parallel local broadband access projects. The capacity of the connection to the CIC must be sufficient to allow for simultaneous peak use of all its stations, while retaining adequate extra capacity for outside Wi-Fi connections as well.

- CIC operation, management and maintenance, should be conducted by designated staff engaged or arranged by the prime CIC contractor under agreement with the USF. These workers should be responsible for assisting customers, managing finances and accounts, maintaining hardware and software, providing training classes and general technical assistance, and overseeing all other CIC operations.

- CIC management may, alternatively, be under the responsibility of local government or officials from a nongovernmental organization, via a separate contract or partnership agreement. In either case, CIC staff should be recruited from among the local community population, and receive adequate training to conduct these jobs.

5.3 Institutional Connectivity

Programs in this category address the broadband connectivity needs of multiple different types of public institutions. Projects may be designed to support broadband connectivity and related ICT resources for university campuses, secondary schools, health facilities, public libraries, and emergency response agencies, among others. Projects of this type should be developed in close collaboration with relevant government ministry and other national and local officials, under an appropriate

memorandum of understanding (MOU) with each partner. Connections to schools are among the priorities in several ASEAN countries, such as the Philippines and Thailand.

Objectives

The objectives of institutional connectivity are complex and largely depend upon the needs of each institution. In general, these projects should seek to align technology deployment with the core mission and functional roles of each partner. Key provisions of the project plans and agreements should include:

- Construction and operation of direct broadband links to designated institutional sites, such as university campuses, schools, hospitals, libraries, and government buildings. These may be in rural areas or in urban locations that are unserved.

- Funding, as appropriate, for ICT equipment, software, and other resources at connection sites, according to agreed terms with partner agencies.

- Support for training and technical assistance for implementing partners in the implementation, use, and management of ICT resources.

- Contractors should provide both network connections and broadband internet service at designated sites, including design, installation, configuration of network connections, and device setup, software installation, and technical support.

- Prices for ongoing ICT services should be determined in advance under an agreed formula, to be paid either by the institutional partner alone, or with some continued financing from the USF.

Project Options

Options for developing projects under this type of program are twofold, addressing (1) the scope and nature of institutions to be connected, and (2) the mechanisms and organizational arrangements for implementing the projects. Alternatives for each category are highlighted below.

Institutions

Priority public institution connections include:

- Educational: All local public schools, university campuses, teachers' colleges, as well as administrative offices. Specific requirements for internal networks,

facilities, and equipment should be determined in collaboration with the ministry of education.

- Health facilities: All local hospitals and health clinics within the community. Technical equipment and facilities to enable these organizations to use their broadband connections should be provided in collaboration with the ministry of health.

- Local government offices: Local government office buildings and annexes, including security agencies such as police, fire, and emergency response. Locations may also include premises of local community organizations, as well as shared facilities that may house relevant public administration activities.

- Agricultural centers: Facilities to support local farmers and community agricultural development.

- Public libraries and post offices: Where such facilities exist, broadband connections and public access to personal computers and internet service can be installed on a cooperative basis.

Implementation

Key features of project implementation include the following:

- The USF should develop separate MOUs with partner ministries to determine the scope of each project.

- The required locations should be identified during each project's planning phase, including geographic areas, size and nature of facilities, and timing of network expansion.

- Connections to each institution must provide adequate bandwidth to allow for the minimum level of projected network usage in each location. The implementing contractor will be responsible for determining the most appropriate access technology and configurations.

- The contractor may also be required to install specified internal facilities and equipment at each location (e.g., a local area network, server, firewall, etc.).

- The contractor or its affiliate will also be responsible for providing ongoing service delivery to all connected institutions, according to agreed pricing, terms, and conditions (to be negotiated as part of project planning and implementation). The contractor should be required to provide comprehensive

training for local management and staff regarding the use of the core ICT systems and applications installed.

Partner organizations will be responsible for managing internal ICT services and applications, and for adapting the technologies to their operational needs.

6.0 ICT Demand Support and Stimulation Programs

For USO programs to promote the full adoption of the broadband ecosystem nationwide, there must be a clear and concerted focus on the demand side of the ICT market. Those citizens, entrepreneurs, and communities that have to date been excluded from the digital revolution may not have the resources and capacity to utilize, or even afford, ICT services.

The impacts of demand support and stimulation projects are twofold. They help new users and communities to get the most benefit out of advanced ICTs, and by increasing local service demand in USO areas, they help generate higher revenues for ICT operators and other suppliers. Together, these effects can enhance the commercial viability of rural and marginal markets, growing the overall national ICT sector.

Also note that some objectives may be more global in nature, in order to be consistent with emerging standards on the international level. Most recently, when the United Nations Broadband Commission updated its objectives for broadband adoption, it included several specific targets for indicators of broadband ICT demand. These are goals that every country is now encouraged to adopt as official policy.

The subsections below describe three main categories of demand support and stimulation programs: ICT applications and content; digital literacy; and affordability. Each of these represents an important set of tools for reinforcing the development of universal broadband ICT ecosystem.

6.1 ICT Applications and Content Development

The most significant effect of the shift of ICTs from voice/text to broadband data services has been the explosion of information content and innovative applications that are available to users via the internet and smart devices. For many populations, however, including rural indigenous people, those speaking only traditional languages, and new users unfamiliar with technology, this wealth of online content may not be easily available or usable.

Some USO programs are now seeking to support the growing need for diversified ICT applications and content by helping to fund development initiatives, from local and community sources to educational programs and ICT entrepreneurs. This is potentially the fastest growing segment of the ICT development sector, and

restructured USO policies can play a key role in accelerating these trends. In ASEAN, several countries, such as in Malaysia, Thailand, and the Philippines, have incorporated support for content development within ICT centers and under education access policies.

Objectives:

The objectives behind projects promoting ICT applications and content include elements focusing on both the information that such projects will make available, as well as the processes, skills, and business models involved in creating these information products. The end goal is to build up local, indigenous sources of information, and locally relevant and useful applications, in a manner that helps establish a viable domestic technology and knowledge sector, while also increasing overall market demand for ICTs. The general objectives of USO projects in this area therefore include:

- Expanding the availability of relevant, valuable, and commercially successful applications developed for and by citizens and businesses within each country.
- Providing important information sources to the public in connection with priority government services, including health, education, agriculture, employment, and similar subjects.
- Supporting innovation and entrepreneurship in the domestic ICT sector, so as to enable new start-up business ventures, particularly small enterprises, to capture a significant portion of national ICT service demand.
- Expanding and preserving local historical and cultural heritage through digitization of traditional information sources and incentives for developing ongoing indigenous data collection and repositories.

Project Options:

Key options for projects to support development of ICT content and applications include:

- Original and translated websites and other materials presented in local, indigenous languages, highlighting information of greatest interest to populations who speak these languages.
- Information content made specifically for and by local community users, sharing local knowledge, history, and culture, as well as business and government information, ideally developed by local users themselves.

- Projects focused on graphic interface, audio-video, and other nonwritten content aimed at engaging and assisting nonliterate users, as well as similar applications and content for disabled or uneducated users.

- Support for entrepreneurial ventures focusing on creating innovative applications for mobile and smart phones, tablets, and other new devices, including projects to help finance tech hubs and ICT incubators.

- Digital finance and mobile money projects, in partnership with banks, to provide access to e-finance for unbanked citizens, and easy funds transfer and payment options.

- Apps to assist citizens living in remote rural areas, in fields such as farming, livestock, fisheries, and forestry.

6.2 Digital Literacy

Beyond the benefits of appealing ICT content, many new users in USO areas need support in understanding the value, use, and capabilities of these technologies, and then in being able to use those capabilities to make better use of ICTs and broadband internet. This can especially be the case for marginalized groups and populations, who have been restricted from exposure and affordable access to ICTs. Recent efforts have begun to focus strong attention on these user needs, in the form of digital literacy programs and related ICT capacity building initiatives that aim to educate, inform, and equip all types of citizens and organizations to become effective users of ICTs.

Digital literacy strategies are also coordinated with programs involving general education and training in technology, and the promotion of business development, entrepreneurship, and innovation in this sector. These types of projects tend to go far beyond the traditional notions of universal service, but they encompass the goals of fostering true universal adoption of the broadband ICT ecosystem. While some ASEAN countries have introduced elements of such support programs, such as the Philippines Tech4Ed program, this is still a new field for the relatively new entrants, who would all benefit from developing forward-looking digital literacy strategies.

Objectives:

Digital literacy and ICT capacity building programs should be designed to meet the specific needs and opportunities of key user groups throughout society. This means that there will need to be multiple approaches and customized strategies, developed through research and consultation with target beneficiaries. in general, the main objectives of all such programs can be summarized as follows:

- Raise public awareness of the role, functions, opportunities, and risks of ICTs, to help encourage beneficial use of the internet, smart phones, and other technologies, while also preparing users to recognize and avoid potential harmful uses.

- Stimulate new and increased use of ICTs, particularly where new services are introduced, and also among groups that may have been excluded from ICT access, such as women, the elderly, indigenous populations, and people with disabilities.

- Help develop ICT skills among the general public, and within target groups, to enhance the overall experience and benefits of ICT use and increase job opportunities.

- Support small and medium entrepreneurs in adopting and deploying ICTs in their local businesses.

- Improve overall communication within target communities, among citizens, local government, businesses, and the broader national and global society.

Project Options:

Projects that seek to enhance digital literacy can focus on raising awareness and skills among the general ICT user population or can focus on specific target groups or communities. In most cases, projects should be implemented through partnerships among USFs, government and donor programs, and partner organizations, such as technical training schools, university programs, local community institutions, and other public agencies. Some of the main options that can be considered in various contexts include the following:

- ICT public relations and awareness campaigns: Publicity, events, advertisements, contests, and other high-profile activities. Projects can be stand-alone or linked to the rollout of new networks and services, to prepare new users to take best advantage of the arrival of broadband ICTs in their communities. Such programs can be developed separately from the infrastructure and service projects, or they can become a mandated feature of such projects, to be designed or subcontracted by operators.

- General training classes and workshops: Projects can support a wide range of public training classes and workshops for beginning ICT users or more experienced citizens who want to learn additional skills. These can be offered through CICs or in other public settings on a periodic or recurring basis.

- Specialized student educational curriculum: Customized classes and applications to teach targeted skills to students such as coding and typing/data entry, introducing technical familiarity in primary and secondary education.

- Community-based technical support resources: Support for training and employment of designated local technical specialists within small and remote communities. These support personnel can be affiliated with CICs or other services, with responsibility to assist local residents with a variety of needs: device use and maintenance, repairs, service and equipment installation, applications, and general technical knowledge.

- Entrepreneurial assistance: Focused assistance to aspiring ICT entrepreneurs on how to start and manage a tech or online business.

- Public administration training: Projects to teach staff of local government offices to use computer systems, databases, and other new technology platforms as they are introduced in local administrations.

- Small businesses training: Projects to teach small business owners and employees how to make use of the cloud-based software business solutions that are now specially made for small businesses and are easily available and useable.

6.3 ICT Affordability

Even as ICT/telecommunications networks and infrastructure are expanding further into unserved areas, affordability of services, especially advanced broadband access, remains a critical issue. In locations already covered by broadband services, large numbers of citizens in less developed societies do not subscribe to and use these services; affordability is the primary barrier. A majority of these unconnected persons worldwide are women.

True universal service policies, therefore, must address the inequities between incomes and service and equipment prices that confront low-income citizens, in order to promote reasonably affordable options to allow everyone to effectively use ICTs.

Policy and regulatory reforms that increase competition and innovation are the best tools to unlock technological advances that continue to reduce the costs of ICT services, facilities, and devices, putting them within reach of increasing numbers of people. However, it is also recognized that some populations will remain beyond the reach of the market, and so there must also be public access initiatives and subsidies to bring these groups into the ICT world.

Objectives:

ICT affordability programs aim to reduce costs and prices for broadband ICTs, specifically for targeted low-income and underprivileged user groups. The Alliance for Affordable internet (A4AI) has proposed a “1 for 2” target for affordable internet access. This goal indicates that 1 gigabyte of mobile broadband data service per month should be available at a price equal to 2 percent or less of average monthly incomes, as measured by gross national income per capita. This standard has recently been adopted as the new affordability target by the United Nations’ Broadband Commission.[10]

Other objectives of affordability programs can target not only broadband connectivity and internet/data use, but also the cost of devices such as smart phones, tablets, and computers, to bring ownership of these devices within the reach of individuals and households.

Project Options:

Several approaches to improving affordability have been introduced in various countries, and more are under consideration. Some key options include:

- Free/affordable internet access centers: CICs and similar facilities that create awareness and train users to connect to the internet. These access centers should offer the user various other facilities such as printing.

- Free Wi-Fi hotspots: After new users have learned the necessary skills at internet access centers, many will want use the internet on their smartphones. Public Wi-Fi signals that permit some limited degree of free data usage, whether via smart phones or laptops/tablets, etc. are therefore very useful.

- Subsidized smart phones: Smartphones are the most often used devices for internet access. Low price (not free) smartphone purchase options linked to mobile operator subscriptions, bundled with free monthly data packages up to a limited extent, help a lot.

- Computer ownership subsidies: This includes low-priced purchase programs for personal computers and laptops purchase for eligible low-income households or students, subsidized by government funds.

[10] A4AI. “UN Broadband Commission Adopts A4AI.” Online post. January 23, 2018. Available at http://a4ai.org/un-broadband-commission-adopts-a4ai-1-for-2-affordability-target/.

7.0 ASEAN USO Case Examples

The Workshop to Support the Formulation of Next Generation Universal Service toward Ubiquitous Broadband Ecosystems (USO 2.0), held in Nay Pyi Taw in March 2018 included presentations from six countries: Cambodia, Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam.

All of the ASEAN Member States that have been following USF strategies for some time (Indonesia, Malaysia, Thailand, and to some extent Viet Nam) are already actively involved in next-generation USF activities described in the previous sections. In fact, even the Philippines, which is not a USO-country, is also pursuing activities that could be labelled as USO 2.0.

ASEAN Member States can be grouped into three categories with respect to universal service funds:

- Economically well-off countries that do not need a USF (Brunei Darussalam and Singapore);
- Countries with universal access/service funds (Indonesia, Malaysia, Thailand, and Viet Nam); and
- Countries in the process of creating universal access/service funds (Cambodia, Lao PDR, Myanmar, and the Philippines).

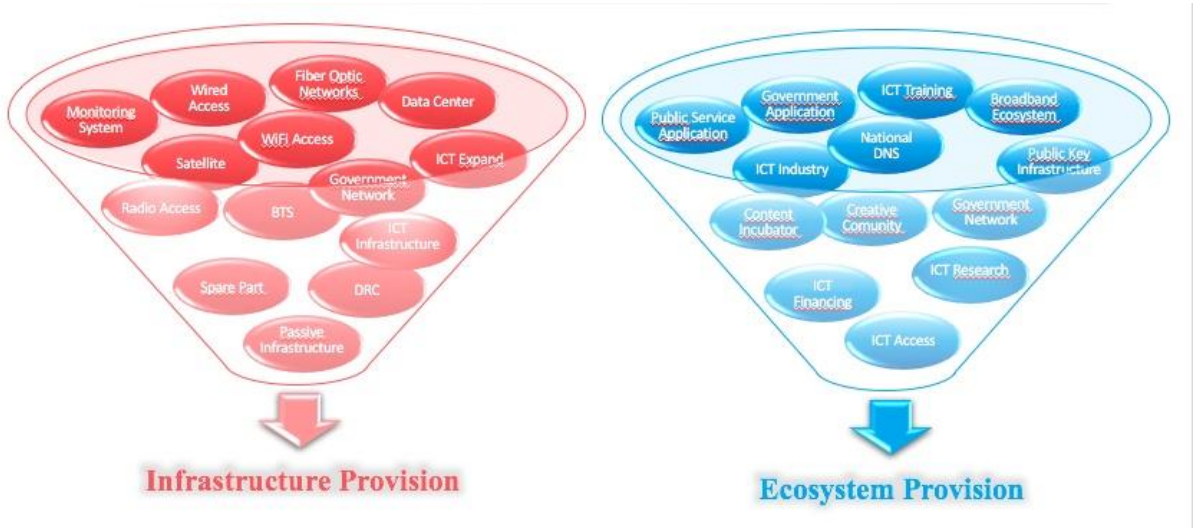
The country cases are summarized below.

7.1 Indonesia

The Indonesian USF is run by a public service agency commonly referred to as BP3TI. Formed by the government in 2005, BP3TI gets its funding from the contributions of telecom operators which make contributions at the rate of 1.25 percent of their annual gross revenues.

The Indonesian USF was recently redesigned in line with the demands of next generation USFs. The redesigned USF is now more focused on the needs of the local communities, using a bottom-up approach. Its projects are tailored to the conditions and readiness of each region and were developed with the participation of stakeholders right from the planning stage. As a result, the redesigned fund now addressed not only the infrastructure of ICT, but also elements of the ICT ecosystem of ICT such as content, apps, and even community empowerment (see figure below). This approach helps ensure that the infrastructure can be optimally utilized by a wide range of stakeholders.

Figure 8. USF Activities in Indonesia



Source: Presentation provided by the delegate from Indonesia at the Workshop on USO 2.0 in Nay Pyi Taw, Myanmar, on 6 March 2018.

Although the Indonesian USF is currently struggling with tough challenges (including government investigations), its revised operational plan shows that it is in line with the concept of next generation USOs.

The Indonesian presentation at the workshop focused on its achievements and the 3 priority projects of BP3TI:

- Palapa Ring Project: This project is the largest of the priority projects and is a true PPP. It has entailed extensive infrastructure investment including laying 13,000 kilometers of submarine optic fiber cables, connecting 57 districts (including 28 cities) in remote islands.
- Internet access: Connecting 5,000 locations in remote islands (2,664 live now)
- The BTS Project: At the time of the workshop it was projected that by the end of 2017, new BTSs at 504 remote locations would have been commissioned.

7.2 Malaysia

The Malaysian Universal Service Provision Fund (USPF) is operated by Malaysian Communications and Multimedia Commission (MCMC) under the universal service provision (USP) regulations promulgated in 2001. Providing broadband internet (rather than just voice) to unserved and under-served individuals and communities became an obligation after an August 2008 amendment to the USP regulations.

The USPF gets its funding from the telecom operators, which make contributions at the rate of 6 percent of their annual weighted revenue (minimum revenue threshold being RM 2 million).

The USPF's 1Malaysia Internet Centre (PI1M) is a prime example of USO 2.0. It is the result of an evolving effort that began with the USP Communication Centers established in 2007. Reflecting the changing needs of individuals and the community, the PIIM not only provides connectivity to bridge the digital divide, it also helps the ICT ecosystem of ICTs by developing human capital and promoting use of ICT to build a knowledgeable society.

Figure 9. Digital Service Centers, Malaysia

Source: Presentation provided by the delegate from Malaysia at the Workshop on USO 2.0 in Nay Pyi Taw, Myanmar, on 6 March 2018.

The well-equipped Digital Service Centers (DSCs), as shown above, are being set up under the PI1M and 841 have been opened so far. They provide various demand side services like e-payment, e-governance, and e-learning. These centers also offer training in ICT entrepreneurship, digital economy, and content creation. In addition, DSCs offer services like online exams and e-health, and act as e-health centers—all in line with the demands of next generation USO.

Other Malaysian USPF initiatives to respond to demand side needs include subsidies provided for personal computers and smartphones.

7.3 Thailand

The Thailand Broadcasting and Telecommunications Research and Development Fund for the Public Interest (BTRDF) was created in 2001, under National Broadcast and Telecommunication Commission (NBTC) and serves as the Thai USF. It gets its funding from contributions of telecom operators, who contribute 2.5 percent of their annual revenues.

Universal service to support building of the nation's digital foundation became the goal of USO efforts in Thailand with the commencement of USO Master Plan (2017–2021). This brought the Thai USF into the USO 2.0 movement.

Various layers of the 2017–2020 Master Plan address the elements of USO 2.0, including availability, affordability, and accessibility.

Figure 10. Thailand USO Master Plan 2017–2020

Source: Presentation provided by the delegate from Thailand at the Workshop on USO 2.0 in Nay Pyi Taw, Myanmar, on 6 March 2018.

As can be seen in the figure above, efforts to improve the availability of broadband services not only target remote villages but also cater to serving broadband to rural schools. 3,920 villages have been covered in 2017–18.

The 2017–2020 Master Plan also calls for the creation special telecenters for schools, under the School Net program. To date, using USF funding, 763 school

telecenters have been built and equipped with all the necessary devices and software.

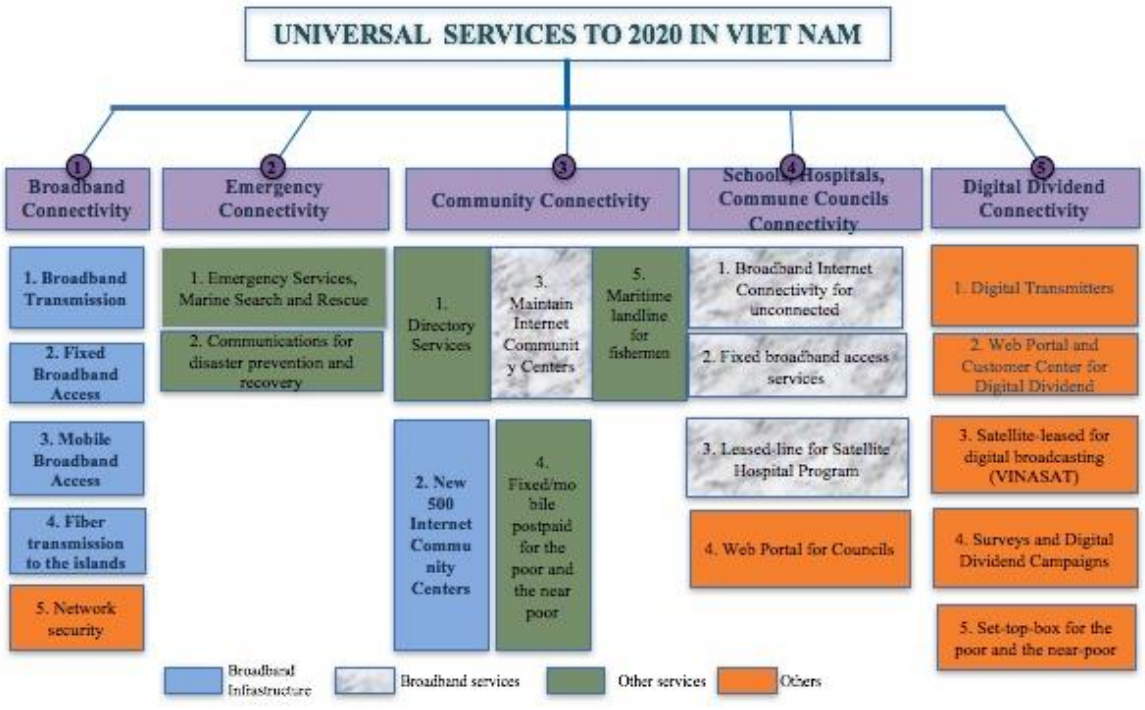
To provide affordable broadband to under-served sectors of the public, the BTRDF sets up telecenters and free Wi-Fi hotspots in remote villages (5,229 Wi-Fi hotspots set up so far). It also includes an emphasis on affordable, scalable technologies, such as rural femtocell sites to bring mobile signals to unserved areas.

Finally, in order to make broadband easily usable—particularly for the disabled, the rural teachers and students—the BTRDF funds ICT training.

7.4 Viet Nam

The Vietnam Public-Utility Telecommunication Service Fund (VTF) under the Ministry of Information and Communications, was established in 2005. It gets its funding from contributions of telecom operators, which contribute at rates that vary from 1 percent to 3 percent of their annual revenues.

Figure 11. Viet Nam Universal Service Plan



Source: Presentation provided by the delegate from Viet Nam at the Workshop on USO 2.0 in Nay Pyi Taw, Myanmar, on 6 March 2018.

VTF is also moving closer to becoming a next generation USO (USO 2.0). Its current universal services program, which will run up to 2020, has projects for both the

supply and demand sides of broadband connectivity. It funds up to 70 percent of CapEx for projects related to overall broadband connectivity through the rollout of fixed and mobile broadband, including optic fibers. VTF also provides funds for demand side programs. The figure on the previous page lays out the operational plan.

Primary activities include the following:

- Connectivity for emergencies, include funding for the Marine Search and Rescue Services, and communications for disaster prevention and recovery;
- Connectivity for communities including setting up new internet telecenters, as well as maintaining existing internet community centers, directory services, and maritime lines for fishermen;
- Connectivity for schools, hospitals, and communes, including developing web portals; and
- Digital broadcasting: funding digital broadcast transmitters (including satellite broadcasting) as well as set-top boxes on the customer side.

7.5 The Philippines

Although the Philippines has not yet established a USF, the indications are that the country is moving in that direction. The necessary policy and regulatory reforms are being undertaken in the form of amendments and revisions to existing ICT policies, laws, and regulations. The Philippines' National Broadband Plan already caters for elements on the supply as well as the demand sides of broadband internet access see the figure on the following page).

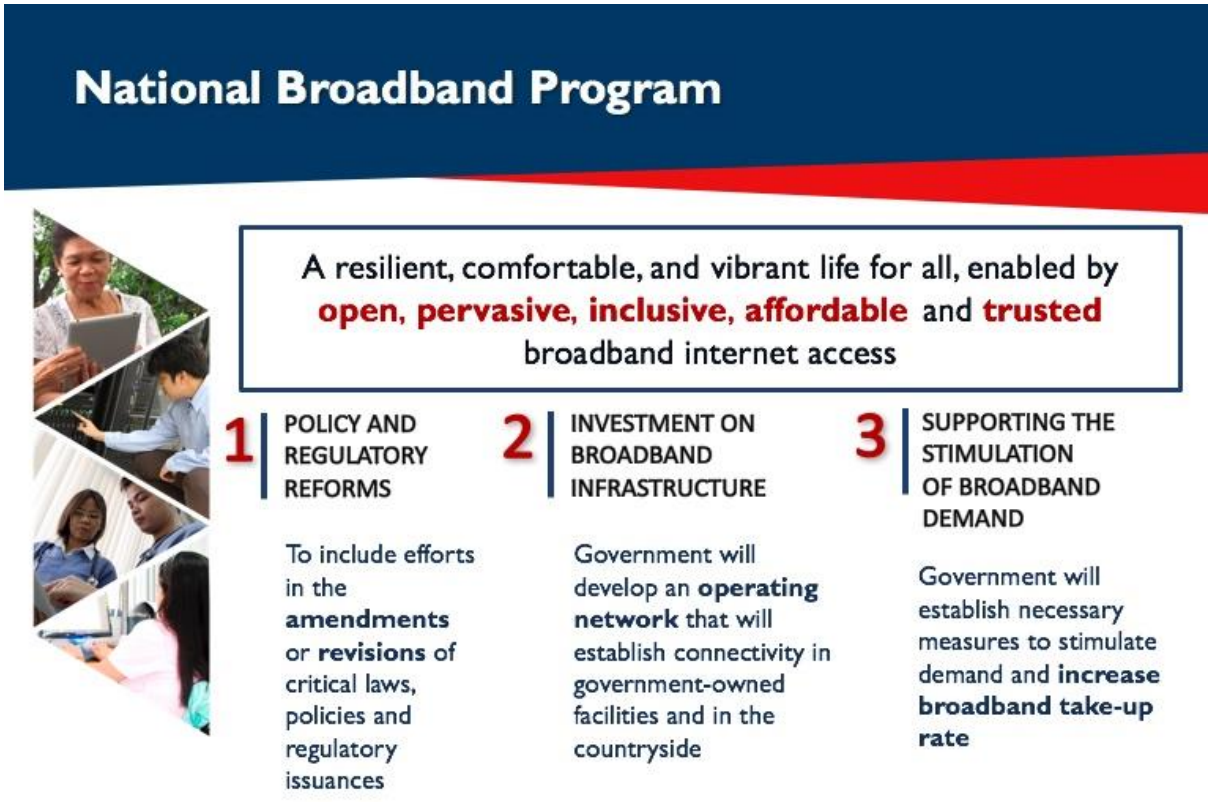
On the supply side, the government is on its way to setting up an operating network to establish connectivity in the countryside. On the demand side, the government intends to take the necessary steps to stimulate demand and increase broadband uptake, by providing "open, pervasive, inclusive, affordable and trusted broadband internet access."

A law for "Free Internet Access Program in Public Places" was signed in August 2017, albeit without addressing the need for a separate USO-like organization to implement the law. The stated target of the 2017 law is to provide free internet at over 13,000 locations; 912 sites had been connected as of December 2017.

Technology Empowerment for Education Employment, Entrepreneurs, and Economic Development (Tech4Ed) is another 'USO2.0-like' initiative. It provides shared access facility to ICT-enabled services and relevant content relating to eAgri and eHealth. Every center has a store to help the center sustain itself.

So far over 2,000 Tech4Ed centers have been established. Nearly 100,000 individuals have registered at these centers, and 58 percent of the registrants are women.

Figure 12. Philippines National Broadband Plan



Source: Presentation provided by the delegate from the Philippines at the Workshop on USO 2.0 in Nay Pyi Taw, Myanmar, on 6 March 2018.

7.6 Cambodia

The start of the USOF in Cambodia was triggered by a royal decree promulgated in December 2015, followed by a sub-decree of July 2017 in which the mechanism for implementation of USOF Program was determined. The USOF falls under Ministry of Post Telecom and Communications and is governed by a board of directors. Its funding comes from telecom operators, which contribute at a rate of 2 percent of their gross annual revenues.

Presently, USOF Cambodia is going through a formative period, in which it is building the institution and its capacity, collecting the necessary data, and preparing pilot projects.

Next steps would include drafting of a national USO law for 2019–2023, as well as building human resource capacities, specifically in two domains: use of the fund, and the review, monitoring and evaluation of projects.

Because USOF Cambodia is still in the early stages of its development, it is too early for it to be addressing USO 2.0 issues.

8.0 Scenarios for Adapting Future USO Policies to Technological Change

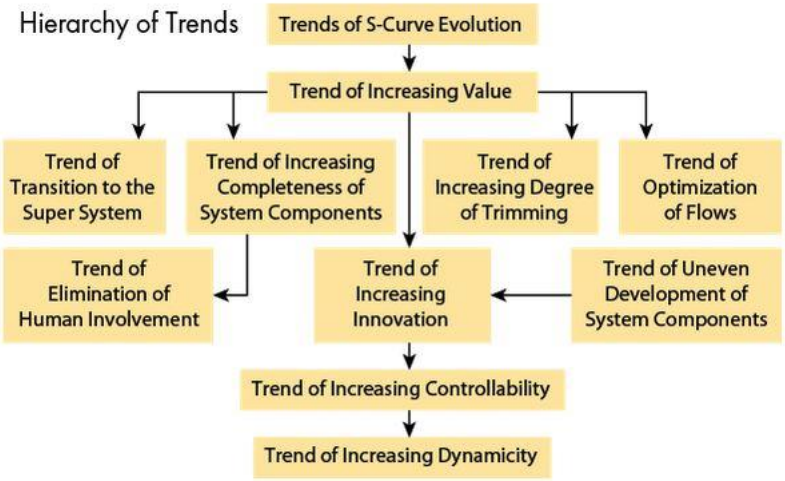
This section provides a brief overview of issues and ideas relating to the evolution of future USO policies in the context of continuing changes in the ICT technology and market landscape.

The global ICT industry has advanced so rapidly, with such revolutionary changes in a short time, that it is very difficult for anyone, from engineers to policymakers (let alone consumers) to keep up with the shifting landscape. For policy planning purposes, however, especially universal service policies, it is critical to take into account these ongoing changes. The discussion that follows offers some guidelines for consideration and further discussion.

8.1 Trends in Technology Evolution

Predicting future technology evolution, especially in a fast-changing, dynamic industry such as ICT, is at best a speculative exercise. The visions of technology futurists in the past have been wrong at least as often as they have been right. Nevertheless, there are well established theories and methods for anticipating the general trends of technology evolution, which can help create a foundation for projecting the next generations and directions of ICTs.

Figure 13. Trends in Engineering System Evolution



Source: Hoon, Douglas “Trends of Engineering System Evolution”

For example, the Theory of Inventive Problem Solving has been developed and adapted over many decades to account for common trends in innovation across industries and technologies. This has produced a widely recognized hierarchy of Trends in Engineering System Evolution (TESE), which technicians and business planners use to forecast future changes in technology (see figure above).

Each of these trends can be identified and examined at a given stage of technology evolution, to anticipate the likely directions of future changes in a system or platform. The trends are not necessarily sequential or mutually dependent. Rather, they tend to occur in parallel and to varying degrees, depending on the nature of the system and its stage of development. In the case of ICT, the following general trends have been prominent throughout the technology revolutions of the recent past:

- S-curve evolution and increasing value: These are basic principles of most technology development. Innovation tends to occur along an s-curve function, featuring three or four stages: slow initial experimentation, then rapid acceleration as the best new ideas are widely disseminated, followed by a slowdown, and sometimes reversal as the wave of changes reaches its limits. Each stage is driven by the motivation to increase value in the system. With ICTs, these trends have been dramatic across multiple generations of transmission, computing, smartphone, and other technologies, which have seen order-of-magnitude improvements in performance accompanied by persistent cost declines for more than two decades.

- Increasing dynamism, controllability, and coordination: These trends reflect the tendency of technology innovators to move in the direction of greater usefulness, flexibility, and functionality for any system. With ICTs, each new service, device, and quality enhancement has produced a broader range of choice and control for end users, while also further integrating and coordinating the role of these technologies in all aspects of social, commercial, and public life.

- Decreasing human involvement and transition to a supersystem: These are somewhat higher-level macro trends as technical systems evolve deeper into their life cycle. They tend to become so integrated into societal and industrial functions that there is less need for humans to operate them. In the same manner, well-established systems that have been improved to near the peak of their potential tend to be incorporated as components of broader supersystems, along with other components, which themselves then continue to evolve. The latest trends in ICTs have been following these patterns. Such developments as the Internet of Things (IoT), machine learning, artificial intelligence, cloud computing, big data analytics, and blockchain cybersecurity all represent increasingly sophisticated systems that are based on automated

interactions among high-level programs with minimal direct human involvement.

Trends in consumer and market behavior are also important to the evolution and adoption of technology by a society. The Theory of Diffusion of Innovations addresses the patterns of market response to technological change. It identifies different stages and categories of consumers, such as innovators, early adopters, and early and late majorities, which tend to follow a bell curve sequence for adoption as a market grows. With ICTs, these patterns have played out both within national markets and across the globe, as new technologies and services have been introduced (fixed line, mobile, Internet, broadband, smart phones, etc.). In developing economies, the pace of ICT diffusion has been constrained by cost, as many citizens have not had access to, or cannot afford, the latest innovations. USO policies have been largely designed to help remove these constraints, and allow the society-wide trend of diffusion to expand more rapidly and equitably.

At a more macro level, the intersections of these technical and market trends have demonstrated a tendency, over time, to stimulate fundamental socioeconomic transformation. In the case of communications related technologies, there has been a recurring pattern of such society-wide impacts for more than a century. Going back to the invention of the telegraph and the telephone, and passing through the introduction of film, radio, television, first generation computers, and many other innovations, these technologies have consistently followed four stages of macro impacts, which have been repeated throughout the most recent Information Age developments:

1. Innovation: The initial discovery, invention, and introduction of a substantial new method or system, enabling fundamentally different and enhanced means of communication.

2. Adoption: Consumer purchase and use of the product or service, typically exhibiting a rapid growth phase after initial uptake, leading to near-term mass adoption as a “must-have” new commodity.

3. Integration: This occurs when an innovation becomes so widely adopted and utilized that it is integrated with many basic functions and activities of daily life. Other products and services and business models are adapted to incorporate or exploit the new technology. There is a marked dividing line between the era “before” and “after” the innovation was introduced.

4. Transformation: The adoption and integration of the technology ultimately leads to a more complete transformation of both social and economic activity across society. It becomes a primary driver of investment, business, social

interaction, and government affairs. Citizens and communities that have not adapted well to the new system are effectively left behind in the modern age.

These persistent trends suggest that, when sufficiently attractive and innovative new technologies are established, it is all but inevitable that they will follow similar paths to those that came before. This does not mean that every new development will transform society. The challenge for science and business is to invent truly effective, useful, valuable devices and systems that can radically upgrade and replace the previous generation of technology. In this regard, there have been more missteps than success stories. But when new potentially transformative technologies do emerge, as evidenced by early adoption, impacts on cost and convenience, integration with other technical and socioeconomic trends, and so forth, it is important to acknowledge and anticipate the directions they are likely to follow.

The implications of these concepts for universal service are discussed in the following sections.

8.2 Scenarios for Future ICT USO Policies

The discussion above about technology and market trends and forward-looking policy principles can be applied as a baseline framework for considering changes to USO policies in light of ongoing technological evolution. The following scenarios highlight some of the most prominent current trends in the ICT ecosystem, and how they might be addressed in future USO programs. While each new development should be studied in-depth in the context of current conditions, the discussion below offers a starting point for analysis and debate:

- High-speed mobile broadband networks (4G/5G): As wireless technology continues to improve, services and applications will migrate to the highest quality networks. Individuals, organizations, businesses, and public sector actors will need access to these platforms to be able to share in the expanding benefits of next-generation ICT, and USO policies will have to keep pace. The eventual goal for all societies should be ubiquitous coverage of all populations with the most advanced and useful networks available.

- Smart devices: Consumers can only use advanced ICT networks, services, and applications if they have access to appropriate devices. These include smartphones, tablets, digital assistants, and a growing array of specialized equipment for personal and business use. The more key functions that require such devices are integrated into daily life, the more important it becomes for USO initiatives to help ensure that all citizens can obtain both service coverage and affordable smart devices.

- Internet of Things: Beyond personal smart devices, the Internet of Things is bringing connectivity to a growing range of appliances, business equipment, and other items. It is unclear which, if any, of these emerging smart machines might eventually become “essential” enough to qualify for universal service support. But it is possible to envision social transformations that could render certain IOT capabilities as indispensable to many households or small businesses as mobile phones have already become.

- Digital finance: In many developing countries, mobile money and other forms of digital financial applications have already emerged as the primary source of banking, payments, and transfers for large segments of the population. Such applications are likely to continue to expand, as traditional banks and even physical currency decline. As digital finance becomes essential to more forms of commerce—including e-commerce—it may be necessary to recognize access to such functions as a priority USO objective.

- Over-the-top (OTT) applications: The scope and use of OTT apps has been expanding rapidly, including voice, messaging, video, social media, and a variety of other services that can be accessed only via advanced digital networks and devices. The impact on telecom operators is to reduce usage revenues from similar services, while increasing demand for data connections. Some have advocated for OTT providers to be required to contribute to USFs, although this may be difficult to implement in practice. USO policymakers might, however, negotiate with some OTT services to support priority access in exchange for contributions, for example.

- ICT education and digital literacy: As ICTs become increasingly advanced and integrated into society, the importance of training all citizens in their use and value also increases. School curricula and public digital literacy programs are becoming a vital gateway to effective participation in the ICT-enabled world. These may soon be among the highest priorities for USO policies and related ICT development agendas.

- Digital security: As advanced ICTs become more ubiquitous, so do the risks associated with personal and business data security. For universal adoption and integration of these technologies to be safe, effective, and valuable, users must be protected from the worst forms of cybercrime and exploitation. It will be important, therefore, for universal service policymakers to coordinate to make sure these policies align with and support digital security laws, monitoring, and enforcement, especially on behalf of the most vulnerable and inexperienced new users.

- Artificial intelligence, virtual/augmented reality: These types of technologies, once the realm of science fiction, are becoming more “real” all the time, with nearly limitless potential applications in the not-too-distant future. While there are already extensive deployments of each in existing products and services, it is likely that the underlying architectures and programs will be continuously enhanced over time and will ultimately be incorporated in a wide range of new devices and applications. Such developments are far beyond the scope of current USO policies and objectives, but it is certainly possible to imagine a next generation of technologies that will become so useful, important, and popular as to demand universal adoption.

9.0 Implications for USO Objectives and Principles

9.1 General Principles

Universal service obligation policies for ICT have two major rationales:

- To promote more equitable access to technologies and services for those citizens and regions that the market has overlooked; and
- To accelerate the spread of socioeconomic benefits of ICTs throughout society, by reinforcing network externalities and public goods that these technologies enable.

As ICTs continue to evolve and transform societies, USO policies must adapt to the changes, while maintaining focus on these primary objectives. This suggests certain key principles that USO policymakers should take into account when reviewing, developing, and revising such policies in anticipation of future technology and market changes. These include the following:

- Avoid distorting the market: USO policies should encourage and complement private, competitive investment, and should not subsidize or distort commercially viable markets. In general, this suggests that new technologies should be given a chance to succeed or fail initially, without USO or other officials picking winners.
- Support and encourage market-based diffusion: USO support should align with the emerging trends of service adoption observed in more established markets, to permit more rapid diffusion of technology throughout the population.
- Do not subsidize outdated technologies: Although older generations of technology might be less costly, allocating USO resources to fund obsolete services will only slow the transition to emerging standards, and leave underserved populations still further behind.
- Support adoption as well as access: Building infrastructure and making services and signals available will not be effective unless citizens are able to adopt and use the latest technologies. USO policies need to ensure that their end result is widespread adoption of advanced ICTs.

- Facilitate use and integration: Beyond adoption, USO policies should also promote effective use of ICTs and their integration into citizens' and communities' social and economic activities.

- Seek to reinforce socioeconomic benefits: Where it is clear that technology trends yield public benefits on a wide scale, USO policies should support and encourage these trends as part of their mandate.

- Emphasize social equity: Priority should be given to social equity goals, bringing in those without access to technology or services, but not by imposing older or minimal quality services which simply leave these groups further behind. USO objectives should be to ensure that the underserved populations have the full opportunity to participate in social transformation arising from ICTs.

- Anticipate change: To the extent possible, USO policies should anticipate changing technologies, market and social behavior, and should be as flexible and adaptive as possible, helping to stimulate innovation, adoption, integration, and transformation.

- Coordinate with other policies, stakeholders: USO policies should be closely coordinated with other ICT policies, with industry and academia, and other stakeholders. The focus of such coordination should be to agree on areas where market stimulus and public service and institutional programs will both promote socioeconomic benefits and accelerate societal transformation trends.

9.2 Priorities for ASEAN USO Policies

The objectives and priorities of ASEAN member states with respect to universal ICT access and service will continue to vary by country, depending on socioeconomic conditions, the level of market development, and policy and regulatory status. For most countries in the region, the key goals will remain to promote access to infrastructure and services, and the ongoing integration of advanced ICTs into citizens' lives and economic activity. The above principles highlight the main considerations that policymakers should take into account in pursuing these objectives.

The examples and findings of this report suggest that there are a variety of options and mechanisms that ASEAN governments can employ, in terms of policies, programs, projects, and other initiatives. These include the following:

- Build-out of broadband infrastructure to reach unserved areas: Although the market may continue to expand on its own, it remains a top priority for

universal service policies to ensure that necessary infrastructure, including backbone networks and fixed and mobile broadband access, be established throughout all territories to the greatest extent possible.

- Public and institutional connectivity: Universal service programs should be designed to prioritize public broadband connectivity, to bring access to the most people in the most important locations. This includes community access centers and similar initiatives such as public Wi-Fi, as well as connections for schools, universities, health clinics, and government offices.

- Demand support and stimulation: As connectivity expands, policies must increasingly focus on ensuring that citizens can take advantage of advanced ICTs in their daily lives. Programs should promote digital literacy, relevant applications and content, and affordability of both services and devices, with a particular focus on groups that have been left behind by the digital revolution.

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